

What is claimed is:

1. A method for producing high-purity hydrogen, comprising:

5 supplying a reducing gas produced by pyrolysis of an organic material to an anode side of an electrolyzer having a diaphragm comprising solid oxide electrolyte; and

supplying steam to a cathode side of said electrolyzer to produce hydrogen and oxygen by electrolytic
10 action;

wherein said oxygen produced in said cathode side of said electrolyzer passes through said diaphragm and reacts with said reducing gas to create concentration gradient of oxygen ions, thus lowering electrolysis voltage.

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2. A method according to claim 1, wherein said electrolyzer comprises a high-temperature electrolyzer.

3. A method according to claim 1, wherein said
20 organic material comprises biomass.

4. A method according to claim 3, wherein said biomass comprises waste wood or raw refuse.

25 5. An apparatus for producing high-purity hydrogen, comprising:

a pyrolysis furnace for pyrolyzing an organic material;

an electrolyzer having a diaphragm comprising solid oxide electrolyte;

a line for supplying a pyrolysis gas produced in said pyrolysis furnace to an anode side of said
5 electrolyzer; and

a line for supplying steam to a cathode side of said electrolyzer.

6. An apparatus according to claim 5, wherein
10 said electrolyzer comprises a high-temperature electrolyzer.

7. An apparatus according to claim 5, wherein said organic material comprises biomass.

15 8. An apparatus according to claim 7, wherein said biomass comprises waste wood or raw refuse.

9. An apparatus according to claim 5, wherein said pyrolysis furnace comprises a dual fluidized bed
20 pyrolysis process having a pyrolysis fluidized bed and a combustion fluidized bed, heating medium is circulated between said pyrolysis fluidized bed and said combustion fluidized bed, and a reducing gas is supplied to said electrolyzer while preventing said pyrolysis gas from being
25 mixed with combustion gas.

10. An apparatus according to claim 9, wherein said reducing gas comprises a high concentration reducing gas.

5 11. An apparatus according to claim 5, wherein a flow control valve is provided in each of said line for supplying said pyrolysis gas produced in said pyrolysis furnace to said anode side of said electrolyzer and said
10 line for supplying said steam to said cathode side of said electrolyzer.